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ROCKY MOUNTAIN SPOTTED FEVER¹

FURTHER EXPERIENCE IN THE THERAPEUTIC USE OF IMMUNE RABBIT SERUM

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There have been several attempts reported in the literature to produce immune serum against the virus of Rocky Mountain spotted fever. One of the earliest was that of Ricketts and Gomez (1) in 1908. They reported that they were able to produce in guinea pigs a serum of neutralizing value only and that the antibody titer was not increased by a second injection of the antigen. Heinemann and Moore (2) published a preliminary note concerning immune serum in 1911, and followed this with a more detailed paper in 1912 (3). They reported the production in horses of a serum with neutralizing value, by using guinea pig passage virus as the antigen. The titer was perhaps increased by a second inoculation of guinea pig virus. They concentrated a small amount of this horse serum (similar to methods then in use for the concentration of diphtheria antitoxin) with an apparent increase in the neutralizing titer. The protocols do not demonstrate therapeutic value. Noguchi (4) reported in 1923 the preparation of an immune serum in rabbits (again using guinea pig passage virus for the antigen) that would protect if given simultaneously with the virus or during the incubation period. Some therapeutic value was possibly shown if the number of infectious doses in the challenge inoculation was greatly reduced. In another paper in 1923 he suggested a vaccine composed of guinea pig virus neutralized with this immune rabbit serum. Parker in 1933 in a letter to the editor of the *Journal of the American Medical Association* tells of an immune serum produced in a goat using tick virus as the antigen that probably had similar therapeutic value to our crude immune rabbit serum prepared with a like antigen. Parker states that he was unable to reproduce these results in a later experiment.

In a previous publication (5) the results of treatment of guinea pigs and monkeys infected with Rocky Mountain spotted fever by

¹ From the Division of Infectious Diseases, National Institute of Health.

the use of an immune rabbit serum were reported. This serum was prepared in rabbits employing infected ticks as the antigen. Most of the serum used in those experiments was crude rabbit serum in which no attempt had been made to purify or concentrate the antibody. However, a small amount had been treated sufficiently to indicate that the antibody could be purified and concentrated by the same methods that are applicable to the concentration and purification of antipneumococcus antibody. Following that report Kurotchin, Van der Scheer, and Wyckoff (6) reported the preparation of an immune rabbit serum with high neutralizing titer by the injection into rabbits of yolk sac highly infectious with the virus of Rocky Mountain spotted fever. They further determined that this rabbit serum could be refined by the same chemical procedures which are useful in purifying antipneumococcal rabbit serum. They also state that in such concentrates the neutralizing titer per gram of protein is increased about twentyfold as compared to the original serum.

It is the purpose of this communication to report on further experiences with the use of immune rabbit serum in the treatment of laboratory animals infected with the virus of Rocky Mountain spotted fever. In section 1 the serums used in the tests are from two sources and differ only in the antigen used for the active immunization of the rabbits. The methods of concentration and purification were identical. The "T" serum was prepared with tick antigen and the "L" serum was prepared by Kurotchin, Van der Scheer, and Wyckoff by the use of infected yolk sac material.

Section 2 has to do with the treatment of human cases of Rocky Mountain spotted fever during the summers of 1941 and 1942.

Section 1. Neutralization Tests

By serum virus neutralization tests the two serums were demonstrated to contain approximately the same antibody titer. The infectious agent in all these tests was plasma from guinea pigs infected with a highly virulent strain of spotted fever and since the minimal infectious dose varied with each animal it was necessary to control each test by titration of the virus. The tests are not comparable to each other because of the variation in the infecting virus, but each individual test is valid and it is entirely feasible to compare the antibody content of serums within the limitations of the test.

The results of one such test are presented in figure 1. The "T" serum and the "L" serum both prevented deaths in the test animals to a dilution of 10^{-4} . The "T" serum was a little more efficient in preventing fevers in the guinea pigs than the "L" serum, but on other tests the reverse has been true. In general, it can be said that there is apparently no great difference in the antibody content of rabbit

serums prepared by inoculating rabbits with either infected ticks or infected yolk sac material.

THERAPEUTIC ADMINISTRATION

Several tests were devised in order to ascertain the experimental therapeutic efficiency of the various lots of concentrated and refined serums. There were two main questions upon which data were desired. The first of these was to determine the amount of serum which was an effective therapeutic dose; the second, the time such a dose would be of benefit. The test guinea pigs were all males of approximately 500 gm.; the infecting dose was 1 cc. of whole citrated blood drawn from a guinea pig infected with a highly

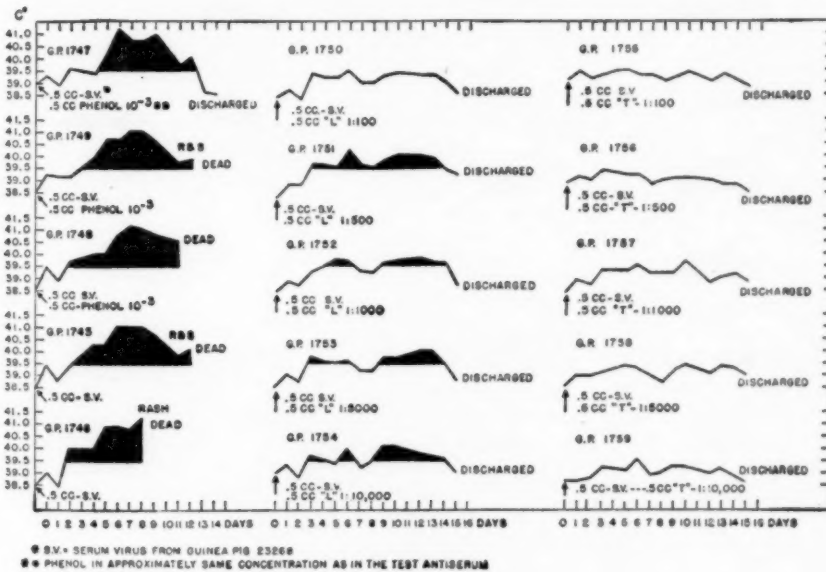


FIGURE 1.

virulent strain of Rocky Mountain spotted fever (the Bitter Root strain) inoculated intraperitoneally. In a preliminary test it was found that a single injection of 0.5, 0.25, or 0.1 cc. of concentrated rabbit serum administered on the first day of fever of the test guinea pig was effective in preventing death. A further experiment was run to see how late in the course of the guinea pig disease such a dose might be effective. The serum dose throughout this test was 0.5 cc. of "L" serum given subcutaneously and the time was varied from 24 up to and including 96 hours after the infecting inoculation. The 72-hour administration of serum occurred on the first day and the 96-hour on the second day of fever.

Figure 2 illustrates the results of this test. The six control guinea pigs all became severely ill, four of them died of the infection, and five

of the six developed scrotal reactions typical of the disease in guinea pigs when infected with a highly virulent strain of spotted fever. The sixth guinea pig died early, before his mates had developed scrotal lesions. In guinea pigs receiving the constant, relatively small dose of serum, the severity of the illness varied directly with the time from inoculation to the administration of the serum. If the serum was administered only 24 hours after the infecting dose, there was a complete suppression of recognizable spotted fever. If 48 hours elapsed, the disease was modified. Here guinea pig No. 2450 died too early to be typical spotted fever, as can be seen by comparison with

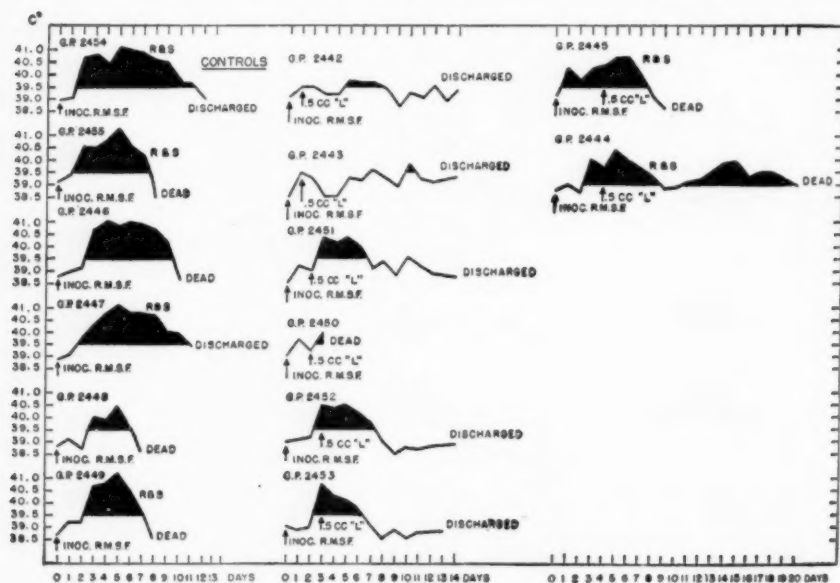


FIGURE 2.

the control animals. If the serum was given 72 hours after inoculation, which was the first day of fever, there was definite modification of the illness with survival. The scrotal lesions as seen in the controls did not occur in these two guinea pigs. If the serum was withheld for 96 hours following the infectious dose, which was on the second day of fever, there was little, if any, effect. Both animals died and both developed scrotal lesions. One animal, No. 2444, had a longer survival time than did the controls.

The same type experiment was done using monkeys as the test animal. The monkeys weighed approximately 8 pounds each and were infected intraperitoneally with 1 cc. of guinea pig passage virus. The concentrated "T" serum was administered intravenously in two dosage levels, 72, 96, and 120 hours after the infecting inoculation.

Figure 3 presents the monkeys' temperature records and the results of this experiment. Both control monkeys developed typical Rocky

Mountain spotted fever, which was fatal after 8 and 9 days, respectively. The two monkeys treated 72 hours after the infecting dose, which was the first febrile day, had a modified illness and both recovered. Neither of these monkeys appeared ill although one of them, No. 497, had considerable fever. The larger dose (4 cc.) of serum was more efficient in modifying the disease than was the smaller dose (2 cc.). In the two monkeys treated 96 hours after infection, which was the second day of fever, there was some prolongation of the disease, although both finally succumbed. They each survived for 12 days as compared to 8 and 9 for the controls. It was thought that perhaps a larger single dose might have been more efficient in these

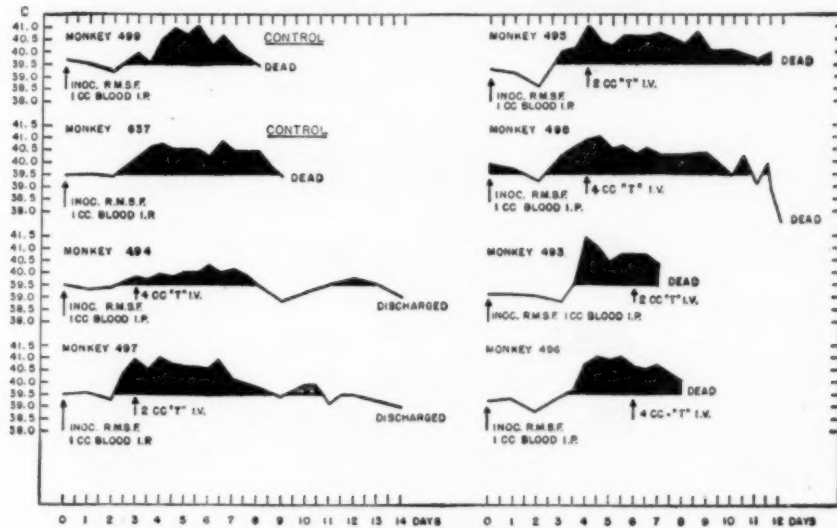


FIGURE 3.

two animals. No effect was seen in the two monkeys administered serum after a lapse of 120 hours following the infecting inoculation.

Since in some experiments it appeared that the relatively small amount of serum was inadequate to prevent death, but yet modified the disease, if more than 72 hours had elapsed from the time of the infecting inoculation, a further experiment was conducted increasing the serum dosage. The guinea pigs were again infected with 1 cc. of guinea pig passage virus intraperitoneally. The "L" serum was again administered subcutaneously, but at three levels—1 cc., 3 cc., and 5 cc. on the second day of fever in this test, 120 hours after the inoculation of the infecting dose. Figure 4 presents the temperature curves and results of the experiment. The six control guinea pigs all developed typical severe Rocky Mountain spotted fever and each of them developed the characteristic scrotal lesions associated with the disease in guinea pigs. Four of the six succumbed to the disease. The two

guinea pigs that received a dose of 1 cc. of concentrated serum both survived. One, No. 2488, developed typical scrotal lesions. The two receiving 3 cc. and the two receiving 5 cc. all recovered and none of them developed typical scrotal lesions.

As in the treatment of other diseases with immune serums, the time factor here is important. In guinea pigs it takes a relatively large dose to prevent death if given when the disease is in the second febrile day. In human beings the characteristic rash does not appear until the third or fourth day of fever. The question then is whether it will

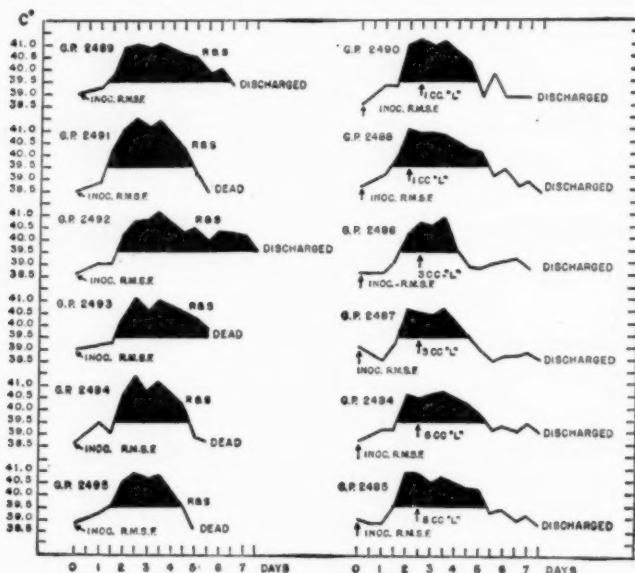


FIGURE 4.

be possible to await this diagnostic sign and still derive benefit from the serum. The experimental animals have in all probability received many times the infecting dose usually received by human cases. The disease in animals is certainly shorter than is the usual human case and for this reason the additional 24 to 48 hours may not be so important.

Section 2. Experience in Human Cases

The animal work with the immune rabbit serum was sufficiently encouraging to warrant its trial in human beings naturally infected with the virus of Rocky Mountain spotted fever. This work was begun in the late stage of the tick season in 1940 and was continued during the summers of 1941 and 1942. Cases were treated both in the eastern section of the country as well as in the West. None of these cases reported had been previously vaccinated against Rocky Mountain spotted fever.

The cases were diagnosed and treated by various doctors; in fact, but few were under the care of any one physician. Many of the eastern cases in Maryland and Virginia were seen by personnel from the National Institute of Health. Some of the cases were treated in the home and the others in hospitals. Other than for the immune serum no recommendations were made as to treatment, this being left entirely to the discretion of the attending physician. Several of the cases received one of the sulfonamides; one case received intravenous metaphen; at least one case received large doses of quinine; several had intravenous fluids; several had blood transfusions; and one had intravenous immune human serum in addition to the recommended dose of the immune rabbit serum. In this connection it has been shown that sulfanilamide and sulfapyridine are actually harmful when given to guinea pigs infected with Rocky Mountain spotted fever (7) (8), and a similar observation has been reported in human beings (9). It is also thought, by those interested in Rocky Mountain spotted fever, that any form of intravenous medication may also be contraindicated. Parker states, "We have used glucose in guinea pigs with the usual result, namely, earlier death than in the controls."² Mainly because of this the immune rabbit serum in all of these reported cases was administered intramuscularly. It is recognized that with this method of administration the antibody is not so rapidly available as it is when administered intravenously and further that larger amounts are necessary to produce similar effects. Perhaps intramuscular administration was an unnecessary precaution, but until more is known, this seemed the safer procedure.

In the series to be reported there was no attempt made at any form of case selection. The only qualification necessary was that the case be early enough that the serum might be of some value. The serum was of the "L" lot described under the animal work. A supply was kept at the Rocky Mountain Laboratory in Hamilton, Mont., as well as at the National Institute of Health in Bethesda, Md. The dosage of serum recommended was 1 cc. per kilo of body weight although some patients received slightly more than this amount, while others received slightly less. The largest dose administered was 160 cc. and the smallest was 20 cc. The method of administration was briefly as follows: (1) a conjunctival test with normal rabbit serum was proposed for evidence of sensitivity to rabbit protein, if negative; (2) 1 cc. of serum concentrate was administered intramuscularly, if no reaction after about 10 minutes; (3) 5 cc. given intramuscularly, if no reaction after 10 minutes; (4) remainder of recommended dosage, up to total of 40 cc., given intra-

² Personal communication.

muscularly; (5) if more than 40 cc. was recommended, the remainder was to be given in one dose, intramuscularly 10 to 12 hours later.

Mainly during the summers of 1941 and 1942, 94 individual doses of anti-Rocky Mountain spotted fever serum were sent out upon request. After a lapse of approximately 1 month, follow-up letters asking for the case data were addressed to the physicians. Ten physicians failed to reply to the questionnaires so that no information is available on their ten cases. There were 84 case histories and other data submitted; of these, seven were not included in further analysis because they were thought not to be Rocky Mountain spotted fever. Brief abstracts of their case histories appear in appendix A. Four of the remaining 77 cases were not given the recommended dosage of serum. One of the four received approximately a sixth of the recommended dose and the other three about half the dose calculated on cc./kg. body weight. Brief abstracts of these case histories, and comments upon them, appear in appendix B. Of the 73 remaining cases to be considered, 1 was in an adult female with a past history of epilepsy. During her illness she had a severe epileptic convulsion, went into shock, as judged by her blood pressure, and died several hours later. The interpretation of her case, complicated by these events, is difficult and has been excluded, but the abstract of her history appears in appendix B.

There was 1 additional case of the remaining 72 which was excluded. This patient recovered from her illness and the serum was administered during a subsequent short febrile illness presumed to be a relapse. A brief abstract of this case appears in appendix B.

There were then 71 cases which, beyond a reasonable doubt, were Rocky Mountain spotted fever. The histories of tick contacts, onset, time of appearance of the rash, and the clinical course were all compatible with this diagnosis. Positive Weil-Felix reactions and positive complement fixation tests confirmed the diagnosis in those patients from whom serums were received. These 71 patients were considered to have had an adequate amount of anti-Rocky Mountain spotted fever serum. They have been divided into two groups: those treated on or before the third day of the exanthem, a total of 52 cases; and those treated after the third day of rash, a total of 19 cases.

The data on the 19 cases given serum after the third day of rash are presented in table 1, while those for the 52 cases treated earlier are presented in table 2. It will be seen that there were two deaths in each series. These two tables have been consolidated by age into tables 1-B and 2-B. In these two tables it will be noted that among the patients treated after the third day of rash (table 1-B) there was 1 death out of 10 cases in the age group under 15, and 1 death out of five cases in the age group of 40 and over. In table 2-B, among those patients treated before the third day of rash, there were no

TABLE 1.—Data on 19 cases of Rocky Mountain spotted fever treated with serum after the third day of rash

Case No.	Initials of patient	Place of treatment	Name of physician	Address of physician	Age of patient	Sex of patient	Date of onset	Date of rash	Date serum given	Amount of serum (cc.)	Date temperature reached 98.6°	Outcome	Reactions
53-B	Mrs. R. B.	Hospital.	R. Barber.	Rawlins, Wyo.	Adult	F.	(¹) 1940 Aug. 13	(¹) 1940 Aug. 14	1941 June 18 1940 Aug. 23	60	1941 July 9	Recovered.	None reported.
54-B	H. T. B.	Home.	F. J. Carpenter.	Lorton, Va.	5	M.	Aug. 5	Aug. 8	Aug. 16	20	Sept. 4	do.	Do.
55-B	Mrs. W. W. R.	Doctor's Hospital, Washington, D. C.	W. C. Barr, Jr.	Annandale, Va.	28	F.	Aug. 5	Aug. 8	Aug. 16	40	Aug. 27	do.	Do.
56-B	R. H.	Paul Kimball Hospital, Lakewood, N. J.	Blackwell Sawyer	Toms River, N. J.	10	M.	June 1	June 7	1941 Aug. 15	40	1941 June 21	do.	Do.
57-B	M. H.	Crawford W. Long Memorial Hospital, Atlanta, Ga.	Fort.	Atlanta, Ga.	9	F.	May 6	May 6	May 13	40	About May 30	do.	Do.
58-B	L. D.	Children's Hospital, Washington, D. C.	Welsh.	Rockville, Md.	4	F.	Apr. 24-25	Apr. 26	May 1	20	-----	Died May 4, 1941	
59-B	Mrs. L. J. K.	Hospital.	D. A. Gordon.	Hamilton, Mont.	50	F.	July 31	Aug. 5	Aug. 13	40	Aug. 19	Recovered.	Do.
60-B	Mrs. M. B.	do.	H. I. Taylor.	Jefferson City, Mo.	41	F.	Aug. 5	Aug. 6	Aug. 11	60	?	do.	Do.
61-B	J. H. K.	St. Mary's Hospital, Jefferson City, Mo.	F. W. Gillham.	do.	14	M.	June 13	June 16	June 27	40	About July 11	do.	Urticaria July 9, 1941.
62-B	J. F. B.	St. John's Hospital, Rapid City, S. Dak.	Kearles.	Rapid City, S. Dak.	26	M.	May 17	May 23	May 31	60	June 4	do.	None.
63-B	B. L. J.	Hospital, Jefferson City, Mo.	Bruce.	Jefferson City, Mo.	12	M.	May 26	June 1	1942 June 8	20	June 14	do.	Mild urticaria June 18, 1942.
64-B	Mrs. C.	Hospital, Laramie, Wyo.	Storey.	Laramie, Wyo.	49	F.	July 16	July 20	July 25	60	Aug. 1	do.	None reported.
65-B	G. W. C.	Hospital, Eugene, Oreg.	Ting.	Eugene, Oreg.	9	M.	July 24	July 26	Aug. 4	20	Aug. 12	do.	None.
66-B	N. W.	Hospital, Greensboro, N. C.	S. F. Ravend.	Greensboro, N. C.	3	F.	Aug. 11	Aug. 15	Aug. 19	40	Aug. 29	do.	Do.
67-B	Mr. B.	Hospital, Big Timber, Mont.	F. W. Paul.	Big Timber, Mont.	Adult	M.	May 18	May 20	May 26	60	May 30	do.	Do.
68-B	H. A.	Hospital, Alto, Ga.	R. H. Cox.	Alto, Ga.	11	F.	May 16	May 17	May 22	40	June 5	do.	Urticaria June 3, 1942.
69-B	P. A. Y.	Home.	McCharles.	Medicine Hat, Canada.	82	M.	June 22	June 27	July 2	60	-----	Died July 8, 1942.	
70-B	R. R. R.	Hospital, Rawlins, Wyo.	C. W. Jeffrey.	Rawlins, Wyo.	44	M.	May 12	May 14	May 25	40	May 28	Recovered.	None.
71-B	J. B.	Hospital, Sheldon, Iowa.	Balkema.	Sheldon, Iowa.	11	F.	June 22	June 26	July 4	60	Not known	do.	None reported.

¹ Temperature of 105.4° on admission to hospital June 13, 1941.

TABLE 2.—Data on 52 cases of Rocky Mountain spotted fever treated with serum on or before the third day of rash

Case No.	Initials of patient	Place of treatment	Name of physician	Address of physician	Age of patient	Sex of patient	Date of onset	Date of rash	Date serum given	Amount of serum (cc.)	Date temperature first reached 98.6°	Outcome	Reactions
1	A. L. W.	Sydenham Hospital, Baltimore, Md.	H. L. Hodes	Baltimore, Md.	4	F.	June 11, 1941	June 11, 1941	June 12, 1941	40	June 22, 1941	Recovered	Urticaria, 6th day.
2	B. S.	Johns Hopkins Hospital, Baltimore, Md.	Max Michael	do.	29	F.	July 30, 1941	Aug. 3, 1941	Aug. 4, 1941	60	Aug. 9, 1941	do.	None reported.
3	D. B.	Franklin Square Hospital, Baltimore, Md.	J. Gluck	do.	10	M.	July 28, 1941	July 31, 1941	Aug. 2, 1941	40	Some time after Aug. 8, 1941	do.	None known, patient removed from hospital on Aug. 8, 1941, for financial reasons.
4	C. H.	University Hospital, Baltimore, Md.	D. Fisher	La Plata, Md.	10	M.	June 3, 1941	June 6, 1941	June 9, 1941	40	About June 19, 1941	do.	None reported.
5	A. M.	Union Hospital	H. A. Cantwell	North East, Md.	66	M.	July 21, 1941	July 22, 1941	July 24, 1941	60	Died July 23, 1941	Died	
6	M. M.	Home	R. E. Feagans	Fairfax, Va.	5	F.	June 17, 1941	June 19, 1941	June 20, 1941	40	June 27, 1941	Recovered	Urticaria on June 23, 1941, with 2 days elev. temp. None reported.
7	W. T. S.	Hospital?	A. R. Bush	Hawkinsville, Ga.	46	F.	July 1, 1941	July 6, 1941	July 9, 1941	40	Not known	do.	
8	D. S.	Home	L. F. Hobbs	Alexandria, Va.	18	F.	Aug. 20, 1941	Aug. 23, 1941	Aug. 25, 1941	40	do.	do.	Do.
9	M. S.	Garfield Memorial Hospital, D. C.	Wm. C. Gwynn	Washington, D. C.	33	F.	June 16, 1941	June 18, 1941	June 20, 1941	60	July 5, 1941	do.	Urticaria of 1 day—July 4, 1941.
10	D. K.	Johns Hopkins Hospital, Baltimore, Md.	E. Walker	Baltimore, Md.	6	F.	May 28, 1941	May 31, 1941	May 31, 1941	40	June 18, 1941	do.	None reported.
11	N. S.	St. Patrick Hospital, Missoula, Mont.	Alderson	Missoula, Mont.	25	M.	July 14, 1941	?	July 21, 1941	50	July 30, 1941	do.	Do.
12	L. P.	Home	H. Freedberg	Washington, D. C.	6	F.	July 29, 1941	July 31, 1941	Aug. 2, 1941	20	Aug. 2, 1941	do.	Do.
13	R. McN.	Missoula, Mont.	C. Thornton	Missoula, Mont.	6	M.	May 11, 1941	May 12, 1941	May 13, 1941	20	May 27, 1941	do.	Do.
14	C. B.	do.	Wirth	do.	2	M.	May 17, 1941	May 20, 1941	May 23, 1941	20	?	do.	Do.
15	D. C.	Easton Hospital, Easton, Md.	Cox	Easton, Md.	9	M.	May 1, 1941	May 5, 1941	May 6, 1941	20	May 26, 1941	do.	Do.
16	C. A. B.	St. Patrick Hospital, Missoula, Mont.	Alderson	Missoula, Mont.	5	F.	Mar. 8, 1941	Mar. 11, 1941	Mar. 11, 1941	20	Mar. 26, 1941	do.	Do.
17	D. P. P.	Memorial Hospital, Lynchburg, Va.	E. G. Scott	Lynchburg, Va.	63	M.	Apr. 22, 1941	Apr. 25, 1941	Apr. 28, 1941	40	May 22, 1941	do.	Do.
18	Mrs. K.	Home	H. A. Latane	Alexandria, Va.	45	F.	July 7, 1941	July 10, 1941	July 11, 1941	40	July 20, 1941	do.	Do.
19	T. M.	County Hospital, Missoula, Mont.	J. M. Nelson	Missoula, Mont.	52	M.	Apr. 23, 1941	Apr. 25, 1941	Apr. 26, 1941	60	May 13, 1941	do.	Do.

20	E. S.	Home.	E. H. Wilson.	Tracy's Land- ing, Md.	45	M.	May 8	May 10	May 12	60	May 21	do	Do.
21	A. K.	University Hospital, Baltimore, Md.	Callahan	Baltimore, Md.	21	M.	June 16	June 21	June 24	60	July 1	do	Do.
22	Mrs. R. H.	do	T. N. Carey	do	36	F.	June 28	July 1	July 2	60	July 16	do	Do.
23	Mrs. R. H.	do	do	do	65	F.	July 31	Aug. 2	Aug. 5	60	Aug. 19	do	Do.
24	Mrs. H.	Barrett Hospital, Dillon, Mont.	Routledge	Dillon, Mont.	51	F.	June 11	June 19	June 22	60	July 6	do	Do.
25	Mrs. F. H.	Home, Pilot Rock, Ore.	Smith	Pilot Rock, Ore.	71	F.	June 26	June 30	July 2	60	July 6 up again on July 11-18	do	Urticaria July 15- 16, 1941.
26	C. F. B.	Home, Havre De Grace, Md.	Foley	Havre De Grace, Md.	23	M.	Aug. 13	Aug. 18	Aug. 19	60	Sept. 2	do	None reported.
27	F. L.	Children's Hospital, Washington, D. C.	Hugh Davis	Washington, D.C.	11	M	July 11	July 13	July 14	40	approx. Aug. 1	do	Do.
28	H. R.	University Hospital, Baltimore, Md.	T. N. Carey	Baltimore, Md.	6	M	June 1	June 6	June 9	40	Aug. 20 1942	do	Do.
29	R. D.	Home	S. H. Williams	Alexandria, Va.	11	M.	Sept. 17	Sept. 20	Sept. 22	40	Sept. 30	do	Do.
30	Not known	do	Brother, Indiana State Health Dept.	Indianapolis, Ind.	27	M.	July 17	July 21	July 22	40	Aug. 3	do	Do.
31	do	do	do	do	24	F.	July 16	July 21	July 22	40	Aug. 3	do	Do.
32	J. D.	Dr. W. H. Groves, Lat- ter-Day Saints Hos- pital, Salt Lake City, Utah.	D. K. Allen	Salt Lake City, Utah.	46	M.	June 6	June 8	June 8	60	June 24	do	Do.
33	P. A.	Hospital, Winchester, Va.	T. A. Gibson	Winchester, Va.	4	F.	June 1	June 3	June 3	40	June 11	do	Urticaria June 10, 1942.
34	J. M.	University Hospital, Baltimore, Md.	W. H. Townshend, Jr.	Baltimore, Md.	13	F.	July 11	July 13	July 15	60	July 27	do	Urticaria July 25, 1942.
35	W. S. H.	Home	J. T. Jackson	Leesburg, Va.	4	M.	July 25	July 28	July 30	40	Aug. 19	do	None reported.
36	F. P.	Sydenham Hospital, Baltimore, Md.	Hodes	Baltimore, Md.	3	F.	June 16	June 18	June 19	20	June 28	do	Do.
37	J. O.	Home	S. W. Hausman	Red Bank, N. J.	6	F.	May 20	May 22	May 24	40	July 2	do	Urticaria May 29, 1942.
38	J. D.	Hospital, Nasawadox, Va.	Lt. Crookery, M.C., U. S. A.	Accomac, Va.	24	M.	June 3	June 7	June 9	60	June 26	do	None reported.
39	J. M.	Frederick City Hospital.	A. A. Pearre	Frederick, Md.	72	M.	July 6	July 11	July 14	60	Died July 21, 1942	Died	
40	D. J.	do	do	do	4	M.	July 4	about July 7	July 8	20	July 18	Recovered	Do.
41	F. P.	Cape Cod Hospital, Hyannis, Mass.	H. F. Rowley	Hyannis, Mass.	17	M.	June 27	July 2	July 4	60	about July 10	do	Urticaria about July 12.

TABLE 2.—Data on 52 cases of Rocky Mountain spotted fever treated with serum on or before the third day of rash—Continued

Case No.	Initials of patient	Place of treatment	Name of physician	Address of physician	Age of patient	Sex of patient	Date of onset	Date of rash	Date serum given	Amount of serum (cc.)	Date temperature first reached 98.6°	Outcome	Reactions
42	J. S.	Georgetown University Hospital, Washington, D. C.	E. N. Ashenbach	Washington, D. C.	9	M.	July 7	July 10	July 13	40	July 23	Recovered	None.
43	W. S.	Home	M. A. Sheppard	Elmer, N. J.	4	M.	July 2	July 5	July 7	20	July 22	do	Do.
44	F. B.	Hospital, High Point, N. C.	C. F. Ridge	High Point, N. C.	62	M.	about Aug. 9	Aug. 11	Aug. 14	60	Aug. 18	do	Do.
45	D. D.	Children's Hospital, Cincinnati, Ohio	A. Diamond	Cincinnati, Ohio	6	F.	Aug. 1	Aug. 2	Aug. 4	20	Aug. 14	do	Do.
46	J. B. K.	University Hospital, Baltimore, Md.	A. F. Lavenstein	Baltimore, Md.	3	F.	June 25	June 27	June 30	20	July 6	do	Do.
47	R. C. W.	do	do	do	5	M.	June 27	June 28	July 1	30	July 7	do	Chill and rise in temperature to 103° fol. 10 cc. dose.
48	W. A.	District Training School Hospital, Laurel, Md.	Dugan	Washington, D. C.	28	M.	July 3	July 5	July 8	60	July 13	do	None.
49	W. S.	University Hospital, Baltimore, Md.	MacCubbin	Baltimore, Md.	28	Color- ed	about July 12	July 19	July 22	60	Aug. 8	do	Do.
50	R. B.	Children's Hospital, Washington, D. C.	McLendon	Washington, D. C.	6	M.	June 7	June 9	June 12	40	June 24	do	Do.
51	F. B.	do	Broochs	do	15 mo.	F.	July 8	July 10	July 11	20	July 28	do	Urticaria
52	D. D.	Home, Indiana, Iowa	E. E. Shaw	Indianola, Iowa	38	M.	Aug. 1	Aug. 4	Aug. 4	160	Aug. 23	do	None reported.

TABLE 1-B.—19 cases of Rocky Mountain spotted fever treated with serum after the third day of rash

Year	Age (years)					
	Under 15		15-39		40 and over	
	Cases	Deaths	Cases	Deaths	Cases	Deaths
1941.....	5	1	3	0	2	0
1942.....	5	0	1	0	3	1
Total.....	10	1	4	0	5	1

TABLE 2-B.—52 cases of Rocky Mountain spotted fever treated with serum on or before the third day of rash

Year	Age (years)					
	Under 15		15-39		40 and over	
	Cases	Deaths	Cases	Deaths	Cases	Deaths
1941.....	10	0	7	0	9	1
1942.....	16	0	7	0	3	1
Total.....	26	0	14	0	12	2

deaths in the group of 26 cases in the age group under 15, nor in the 14 cases in the age group 15-39. In the age group of 40 and over 2 deaths occurred; one patient was 66, and the other was 72 years of age.

Since it is practically impossible to have an untreated group serving as controls in this disease, which is so sporadic, it will be necessary to compare these observed fatalities with the expected fatalities as reported for Rocky Mountain spotted fever. Statistics were collected from two eastern States (Maryland and Virginia) and from two western States (Montana and Idaho) for a 10-year period some time ago (10). These figures will serve as a basis for comparison and are presented in table 3. It will be noted from this table that there is no significant difference in fatality rates between the two eastern States and the two western States provided the ages are taken into account. There is a considerable difference in fatality rates between various age groups. It will also be noted that for the age group under 15 there is roughly a fatality of 12.5 percent, for age group 15-39 a fatality rate of 13 percent, and for the group over 40 years a fatality rate of about 40 percent. The totals from table 2-B have been placed in table 2-C as the observed and are compared with expected fatalities from table 3. It will be noted that for all age groupings the observed number of deaths was less than the expected and the fatality rates are correspondingly lower. A similar table (table

1-C) has been prepared for the 19 cases treated after the third day of rash. There is little if any difference in table 1-C between the observed and the expected fatalities.

TABLE 3.—*Rocky Mountain spotted fever. Cases occurring in certain western and eastern States, by age and fatality rate*

State	Number of cases	Number of deaths	Fatality rate	Under 15 years				15-39 years				40 and over			
				Cases	Percent of total	Deaths	Fatality rate	Cases	Percent of total	Deaths	Fatality rate	Cases	Percent of total	Deaths	Fatality rate
West:															
Idaho.....	293	101	34.4	27	9.2	7	25.9	108	36.8	22	20.3	158	53.9	72	45.5
Montana.....	454	109	24.0	81	17.8	6	7.4	156	34.3	18	11.5	217	47.8	85	39.1
Total.....	747	210	28.1	108	14.4	13	12.0	264	35.3	40	15.1	375	50.2	157	41.8
East:															
Maryland.....	330	66	20.0	155	46.9	19	12.2	85	25.7	13	15.2	90	27.2	34	37.7
Virginia.....	331	56	16.9	155	46.8	21	13.5	104	31.4	8	7.6	72	21.7	27	37.5
Total.....	661	122	18.4	310	46.8	40	12.9	189	28.5	21	11.1	162	24.5	61	37.6

NOTE: All cases and deaths as reported to the State Health Officer; Montana, Idaho, and Maryland, 1930-39, inclusive; Virginia, 1933-39, inclusive.

TABLE 1-C.—*The observed and expected fatalities in the 19 cases treated after third day of rash*

	Age (years)								
	Under 15			15-39			40 and over		
	Cases	Deaths	Fatality rate (percent)	Cases	Deaths	Fatality rate (percent)	Cases	Deaths	Fatality rate (percent)
Observed (from table 1-B)...	10	1	10	4	0	0	5	1	20
Expected (from table 3).....	10	1.25	12.5	4	0.5	13	5	2	40

The differences noted in table 2-C of the 52 cases treated fairly early in the course of their illness, while not great when considered from a statistical viewpoint, are within the range that is ordinarily considered significant. A reduction in fatality for a group of 52 cases from an expected of 9.8, or 18.8 percent, to an observed of 2, or 3.8 percent, would occur approximately once in one hundred times by chance alone.

It will also be noted from the data presented for the 71 cases that the only untoward reaction noted from serum administration was urticaria some 7 days later. There were no sharp elevations of temperature or pulse rates, and no severe chills following its administration. The urticarial reaction was noted in 12 of the 71 cases, or 14 percent of the total. (This is about the expected incidence following this type of serum therapy.)

In the analysis of these 71 cases no attempt has been made to utilize duration of fever, amelioration of symptoms, or any other measure except case fatality rates. Other factors are so variable and so susceptible to individual interpretation that they have been disregarded.

TABLE 2-C.—*The observed and expected fatalities in the 52 cases treated on or before the third day of rash*

	Age (years)											
	Under 15			15-39			40 and over			Total, all ages		
	Cases	Deaths	Fatal- ity rate (per- cent)	Cases	Deaths	Fatal- ity rate (per- cent)	Cases	Deaths	Fatal- ity rate (per- cent)	Cases	Deaths	Fatal- ity rate (per- cent)
Observed (from table 2-B).....	26	0	0	14	0	0	12	2	16.6	52	2	3.8
Expected (from table 3).....	26	3.2	12.5	14	1.8	13	12	4.8	40	52	9.8	18.8

SUMMARY AND CONCLUSIONS

From the animal experiments it would seem that it is entirely possible to produce an immune serum in rabbits by the use of live virus, either from infected ticks or infected yolk sacs, as the antigen, since experimentally the "L" serum acted in a comparable manner to the "T" serum.

The administration of this serum to infected guinea pigs and monkeys demonstrated its therapeutic value when given early. With small doses it was found, experimentally, that the therapeutic effect varied inversely with elapsed time from the inoculation of the infecting dose to the administration of the serum. If given within 24 hours after infection, it would completely suppress the disease. If a small dose were given either 48 to 72 hours following the infection, it would modify the disease in such a manner as to prevent death as well as the scrotal reaction of spotted fever in guinea pigs. This small dose was of no value after 72 hours, but if the dose was increased benefit could be demonstrated as late as 120 hours after infection (the second day of fever.)

The results of the human trial are not conclusive, mainly because of the relatively small number of the cases in the series. Data have been presented which indicate that the observed fatality rate in those cases treated before the third day of rash was considerably below that expected from past experience with patients receiving no serum. Of the 52 cases treated in this group there were only two deaths, both in males 66 and 72 years of age, respectively, or a fatality rate of 3.8 percent as compared to the expected rate of approximately 18.8 percent.

It is therefore thought that anti-Rocky Mountain spotted fever serum should be considered as offering hope in the treatment of this disease, particularly if administered early in its course. A definite opinion as to its true value should, however, be withheld until additional observations have been reported.

ACKNOWLEDGEMENTS

It is desired to express appreciation to Dr. R. W. G. Wyckoff and the Lederle Laboratories for the preparation and supply of the "L" serum used in these studies and to the many physicians whose cooperation made the human trials possible. It is also desired to acknowledge gratefully the advice and assistance furnished by Dr. R. R. Parker, Director, Rocky Mountain Laboratory, Hamilton, Mont.

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Appendix A

A-1.—P. C. V., a 21-year-old Maryland female. Removed tick from heel on August 13, 1942. Local area of infection about site of tick attachment August 18. Local treatment to spreading area August 19. Fever of 100°-103° on August 21-August 22 and August 23. A weeping rash on lower part of both legs noted August 22. Reported as Rocky Mountain spotted fever on August 23 and given serum. Weeping rash on both legs receding on August 24. Normal temperature on August 25, 1942, and thereafter.

Impression: Not at all suggestive of Rocky Mountain spotted fever.

A-2.—L. R., a 37-year-old Missouri male. Removed a tick from left groin on May 16, 1942, with a pocket knife. Patient noticed swelling of left inguinal glands and marked tenderness over area. Chills, fever, and pain in left groin began on May 21. Anti-Rocky Mountain spotted fever serum given on May 24 although

there was no suggestion of a rash. Patient developed an undescribed exanthem on May 30, 6 days after serum therapy. Developed signs of pulmonary consolidation June 4—died June 6, 1942—at which time all serological tests reported as negative.

Impressions: Not typical of Rocky Mountain spotted fever as there was no rash until 14 days from onset which was 6 days after serum therapy. Case may have been one of septicemia from local infection in left groin, or even perhaps tularemia.

A-3.—B. S., a 22-year-old New Jersey male. Onset September 6, 1942, with headache. Generalized rash (except face), chills, fever 103° on September 7. Given anti-Rocky Mountain spotted fever serum on September 8. Rash disappeared and temperature fell to normal on September 9, 1942. Patient remained well thereafter.

Impression: Not Rocky Mountain spotted fever.

A-4.—E. P., a 21-year-old pregnant New Jersey female. Onset June 29, 1942, with nausea, weakness, drowsiness, chills, temperature 103°, and abdominal pain. Operation June 29 for appendicitis. Appendix removed—pregnancy not disturbed. Pathological report on appendix was "no definite pathology." On June 30 patient developed chill, fever 104°, and generalized rash. Given anti-Rocky Mountain spotted fever serum on July 1. Temperature fell by crisis 2 days later and rash began to disappear. Patient made an uneventful recovery. All agglutination tests reported as negative.

Impression: Not Rocky Mountain spotted fever.

A-5.—H. N., a 27-year-old Virginia male. Onset May 25, 1941. "When he became sick with a rash, which was first noticed on his face, then later on extremities and trunk." Admitted to hospital June 2—patient could not be aroused, temperature 103°, widespread, fine, macular, purplish rash. There was rigidity of the neck and extremities. Grasping reflex of hands and positive Kernig present.

Laboratory data: W. B. C. 17,500 \bar{c} 83 percent p. m. n.'s. Spinal fluid—570 white cells 63 percent p. m. n.'s. Smear and culture negative. Agglutination tests negative. Blood culture negative.

Course: Given anti-Rocky Mountain spotted fever serum on approximately the eleventh day of rash. Finally given intravenous sulfapyridine. Patient died on June 11, 1941.

Impression: Probably not Rocky Mountain spotted fever. The early appearance of the rash, its description, the evident brain involvement, the 570 cells in the spinal fluid, point perhaps to an infection with the meningococcus.

A-6.—L. L., a 34-year-old Virginia female. Onset January 22, 1943, with headache, sore throat, chills; January 23—temperature 103°–104.6°. Irrational at intervals. Rash appeared on legs between knees and ankles January 24 and later in the day on forearms. Rash on soles and palms January 25—on rest of body January 26. Anti-Rocky Mountain spotted fever serum given on January 26. Temperature returned to normal on January 29 and remained so thereafter. Three separate samples of serum have been tested at the National Institute of Health both by the Weil-Felix and complement fixation tests and all have been negative. The State epidemiologist investigated the case and could obtain no history of tick or other arthropod contacts. Approximately 10 days prior to onset six of seven cats had died on the farm.

Impression: Not Rocky Mountain spotted fever because of lack of tick contact, did not occur during the proper season, and could not be confirmed by laboratory serological tests.

A-7.—F. N., a 26-year-old Missouri female. Patient gave no history of tick contact. Came into hospital with a history of having been ill for 1 week. A universal macular rash present on admission, temperature 102°. Given anti-Rocky Mountain spotted fever serum—rash disappeared and temperature de-

clined to 99° in about 48 hours. She was temperature free and showed only slight ecchymosis in region of both breasts for 6 days. A hemorrhagic rash then appeared over entire body, she had marked generalized edema, and bled from the alimentary tract, genitourinary tract, and from the nose and mouth. Markedly disoriented for about 10 days, gradually recovered after transfusion therapy.

Impression: Not Rocky Mountain spotted fever.

Appendix B

Abstracts of records of four cases treated with inadequate dosage of anti-Rocky Mountain spotted fever serum

B-1.—J. B., a 68-year-old Utah male. Onset June 20, 1942; first seen by physician on June 25; temperature 102°, beginning delirium, and petechial rash about wrists and ankles. Had been in sheep camp on Utah-Idaho line. Ten cubic centimeters (all that was available) of anti-Rocky Mountain spotted fever serum given on June 28. Patient died June 29, 1942.

B-2.—J. A., a 60-year-old Montana male. Onset July 3, 1941, with headache and dizziness; fell while having breakfast, temperature 103.8°. Had been on a fishing trip in Montana and removed tick from left axilla on or about June 30, 1941. Removed to hospital where slurring of speech was noted. There was a pulse deficit of about 20/min at the wrist, and the blood pressure was irregular. July 4—temperature down in morning, high in evening. Patient was irrational and required restraint in bed. July 5—in the morning a punctate rather dull colored petechial rash appeared over both ankles. By afternoon there was a similar eruption over back. Patient now partially incontinent. Forty cc. of anti-Rocky Mountain spotted fever serum administered at about midnight into the gluteal muscle. Patient became progressively worse and died before the remainder of the calculated dose of serum could be administered the next morning. The physician notes that the patient died of circulatory failure.

Discussion: This case excluded from analysis as patient obviously in extremis at time of treatment. Doubtful if much if any absorption of intramuscularly administered serum.

B-3 and *B-4.*—Two cases, age unknown, in a small town in Wyoming. Sufficient serum was obtained to treat one case but this was divided between these two cases. One of these cases died on approximately the tenth day of illness, the other on the thirteenth. Date of appearance of rash and of serum administration not known.

A note from Dr. N. H. Savage, Director of Division of Epidemiology, State of Wyoming Department of Public Health, to Dr. R. R. Parker states, "On a recent visit to ———, I learned that it (antiserum) had been used on three patients there. One patient was given the recommended dosage and recovered completely, although desperately ill at the time of treatment. The other two cases were each given one-half the recommended dose and both died. I think these facts should be borne in mind in evaluating the results of treatment."

Abstract of record of one case treated during presumed relapse

B-5.—Mrs. G. B., adult white Montana female. Onset April 17, 1942, with severe chills, fever, and general malaise some 4 days after having removed a tick from her body.

Course: Temperature 101.5° on April 17—dropped to normal on April 18 and April 19. Went to 100° on the 20th, then to 103° on the 21st. She developed a macular rash, and anti-Rocky Mountain spotted fever serum was administered on April 22. Temperature only 100° on April 23, and normal on April 24; to remain so thereafter.

Discussion: Much too mild an illness to be Rocky Mountain spotted fever. No confirmation, as serum sample could not be obtained.

Abstract of record of case of Rocky Mountain spotted fever complicated by epilepsy

B-6.—E. W., a 40-year-old Montana female with a past history of epilepsy. Removed a tick from right axilla on April 5, 1941. Onset on April 8. Rash not observed until April 13 but may have been present at least 1 day previously (note from Dr. R. R. Parker). Forty cubic centimeters of anti-Rocky Mountain spotted fever serum given on April 14. Patient had no untoward reaction and apparently was improved. On April 15 patient had a severe epileptic convulsion—blood pressure fell to 50/35, pulse became weak and thready. Patient never became rational again, blood pressure remained low, and patient died in about 8 hours.

AN IMPROVED ANTIGEN FOR COMPLEMENT FIXATION IN AMERICAN TRYPANOSOMIASIS¹

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Although the complement fixation test has been used frequently in the diagnosis of American trypanosomiasis (Chagas' disease), difficulties have been encountered in the preparation of a satisfactory antigen. In 1936 Kelser (1) reported a successful antigen made from cultures of *Trypanosoma cruzi* grown on artificial media. This antigen was preserved in glycerine and remained usable for 1 month. Romano and Dias (2) recently have used an alcoholic extract of cultured trypanosomes. The purpose of this paper is to report the simple preparation of an antigen that retains its potency for many months.

Cultures of *T. cruzi* are grown on a medium similar to the one used by Kelser. A blood agar base is made of the following composition: Beef or horse meat infusion, 2 percent proteose peptone No. 3 (Difco), 0.7 percent sodium chloride, 0.5 percent dextrose, 2 percent agar, and 10 percent defibrinated rabbit blood. The pH is adjusted to 7.6, and the sterile dextrose solution and blood added just before tubing. About 25 cc. of this media is slanted in large tubes, 25 mm. × 200 mm. in size. After the slant has solidified, it is covered with about 25 cc. of infusion broth containing 2 percent proteose peptone No. 3 and 0.5 percent dextrose. The tubes are inoculated with 0.5 cc. to 1 cc. of an actively growing culture of *T. cruzi* and incubated at 25° to 28° C. for 10 days.

It has been our experience that strains recently isolated from animals or from other media require several transfers in smaller amounts of media before attaining the maximum cultural activity.

The broth containing the organisms should be drawn off carefully and centrifuged rapidly to pack the trypanosomes which then are

¹ From the Division of Infectious Diseases, National Institute of Health. Part of this work was done at the Bureau of Laboratories, Texas State Department of Health, Austin, Tex.

washed three times with normal saline by rapid centrifugation, preferably at 4° C. Finally the material is washed and centrifuged in a 15 cc. graduated centrifuge tube using saline containing merthiolate (1:10,000). The volume of packed material is measured, the washing solution poured off, and nine volumes of saline with merthiolate (1:10,000) added. The amount of packed material varies, but at least 0.5 cc. should be obtained from the growth in 20 large tubes.

This suspension is frozen in dry ice and methyl cellosolve, and allowed to thaw slowly. The freezing and thawing is repeated three times. The material is ready for titration and after shaking is a grayish white, fine, homogenous suspension. On standing, the suspension will settle and should be shaken thoroughly before use. The stock antigen is kept tightly stoppered at 4° to 6° C.

This antigen was titrated with a 1:10 dilution of serums from infected guinea pigs or from rabbits injected intravenously with the antigen. The undiluted stock antigen was frequently anticomplementary but was rarely so in dilutions of 1:10 or greater. None tested so far has been hemolytic. A good antigen will fix complement when diluted 1:60 or 1:80. In our experience this is about three times as potent as unfrozen antigen in glycerine. In order to attain the highest sensitivity for testing serums, the dilution of stock antigen should be about twice the lowest dilution that is not anticomplementary.

The Kolmer technique for complement fixation (3) using serial dilutions of serums and the quantitative technique as used by Bengtson (4) have been followed successfully in testing the serums of infected animals and humans. Using an antigen made from a human strain of *T. cruzi*, fixation has been obtained with infected guinea pig serums in dilutions of 1:40 or greater. The serums of 10 monkeys showed no fixation in any dilution before the animals were infected with *T. cruzi*, but 4 to 6 weeks later fixation occurred in a 1:80 dilution or higher of the serums from 8 monkeys, and in a 1:40 and 1:10 dilution in the other two serums, respectively.

Samples of serum² from nine human cases of American trypanosomiasis have been tested with this antigen. One was positive in a 1:160 dilution, three in 1:40, three in 1:20, and two, not tested in higher dilutions, were positive in a 1:10 dilution. Known normal human serums have been consistently negative. Of six serums from convalescent malaria patients, one was positive in a 1:20 dilution and the others were negative. Sixteen syphilitic serums were negative in dilutions of 1:10.

² These samples were furnished by Dr. Salvador Mazza, University of Buenos Aires, Jujuy, Argentina; Dr. Emmanuel Dias, Instituto Oswaldo Cruz, Rio de Janeiro, Brazil; and Dr. Felix Pifano, Instituto Nacional de Higiene, Caracas, Venezuela, to whom the author wishes to express his indebtedness.

This antigen has proved to be very stable. Of seven lots tested, all retained their original potency 6 months after being made, and of two tested a year after preparation, both remained potent although the titre had diminished. Two portions of one lot kept for 1 month at room temperature and in a 37° C. water bath, respectively, exhibited only a slight reduction in titre.

SUMMARY

A stable antigen, easily prepared by freezing and thawing the cultural forms of *Trypanosoma cruzi* in saline with merthiolate (1:10,000) has fixed complement satisfactorily in the presence of serums from human beings and animals infected with this trypanosome.

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PREVALENCE OF COMMUNICABLE DISEASES IN THE UNITED STATES

March 28-April 24, 1943

The accompanying table summarizes the prevalence of nine important communicable diseases, based on weekly telegraphic reports from State health departments. The reports from each State are published in the Public Health Reports under the section "Prevalence of disease." The table gives the number of cases of these diseases for the 4-week period ended April 24, 1943, the number reported for the corresponding period in 1942, and the median number for the years 1938-42.

DISEASES ABOVE MEDIAN PREVALENCE

Meningococcus meningitis.—The number of cases of meningococcus meningitis rose from 2,272 for the preceding 4-week period to 2,389 for the 4 weeks ended April 24. The current incidence was the highest on record for any 4-week period, the nearest approach to it being in 1929 when 1,289 cases were reported for the period corresponding to the one under consideration. The years 1939, 1940, and 1941, within which period the 5-year median falls (1941), were years of low men-

ingitis incidence, and probably a more significant comparison is with the average (839 cases) for the years 1935-37, the current incidence being about 2.8 times that figure.

The table shows, by geographic areas, the number of cases reported for recent weeks in comparison with the experience of the 2 preceding years and also that of the peak year of 1929. All regions of the country have contributed to the sharp rise of this disease that became apparent the latter part of 1942, but the largest excesses over the normal seasonal expectancy have been reported from the Atlantic Coast,

Meningococcus cases reported by weeks during 1943 with comparative data for the corresponding period in 1942, 1941, and 1929¹

Division	Week ended—1943													
	Jan. 30	Feb. 6	Feb. 13	Feb. 20	Feb. 27	Mar. 6	Mar. 13	Mar. 20	Mar. 27	Apr. 3	Apr. 10	Apr. 17	Apr. 24	May 1
All regions:														
1943.....	339	330	446	398	503	556	525	619	572	595	606	619	549	591
1942.....	65	60	42	84	87	70	88	91	90	111	112	88	79	80
1941.....	53	48	46	46	44	56	43	53	54	70	48	53	62	33
1929 ²	268	226	256	196	303	297	332	325	330	326	338	295	276	283
New England:														
1943.....	50	42	49	60	52	61	56	76	88	59	79	72	64	64
1942.....	6	5	5	5	14	17	10	12	11	13	7	7	12	13
1941.....	3	1	3	3	3	2	3	4	4	5	1	2	2	9
1929.....	7	7	3	2	6	11	9	7	6	11	9	5	12	5
Middle Atlantic:														
1943.....	57	67	94	92	108	117	104	125	133	145	115	135	128	159
1942.....	19	17	10	18	16	14	19	29	31	40	38	29	25	25
1941.....	9	7	13	13	8	11	7	9	15	14	13	10	14	9
1929.....	66	55	58	51	61	54	68	55	27	79	55	48	42	52
East North Central:														
1943.....	39	38	26	46	41	44	58	40	57	67	51	68	86	96
1942.....	4	5	5	3	7	4	9	7	5	5	8	4	8	3
1941.....	3	5	4	4	2	8	8	7	4	7	2	12	4	5
1929.....	51	43	49	48	63	78	89	65	123	115	122	101	102	105
West North Central:														
1943.....	24	27	19	22	34	43	25	38	31	22	38	55	27	39
1942.....	2	3	3	1	4	2	2	2	2	3	3	8	2	2
1941.....	0	6	3	3	1	5	2	4	1	2	2	3	3	2
1929.....	24	32	40	33	46	49	42	63	30	29	34	40	29	31
South Atlantic:														
1943.....	68	71	116	72	104	105	105	159	95	106	119	131	85	103
1942.....	19	13	7	17	20	14	21	19	20	22	20	21	13	17
1941.....	19	5	7	7	17	10	8	8	13	21	10	12	18	9
1929.....	17	6	6	7	7	6	15	13	5	10	5	7	8	7
East South Central:														
1943.....	22	16	35	13	64	45	54	74	53	90	52	44	62	38
1942.....	7	7	3	3	10	3	6	5	8	6	8	9	12	10
1941.....	10	14	12	12	8	9	7	8	11	11	11	8	10	5
1929.....	8	7	6	5	5	2	8	12	6	6	5	14	3	4
West South Central:														
1943.....	21	16	31	18	29	27	45	48	46	29	66	35	13	25
1942.....	3	7	4	31	10	8	15	11	4	8	11	8	1	6
1941.....	8	7	2	2	1	8	4	5	4	7	3	2	7	0
1929.....	35	20	16	10	15	13	18	15	13	18	31	11	13	11
Mountain:														
1943.....	10	7	17	11	18	25	20	12	8	6	30	18	25	16
1942.....	1	2	1	2	3	1	1	1	0	1	3	0	1	0
1941.....	0	0	1	1	2	0	2	2	0	2	1	0	1	0
1929 ²	38	35	54	25	61	54	56	41	50	34	33	28	35	32
Pacific:														
1943.....	48	46	59	64	53	89	58	47	61	71	56	61	59	51
1942.....	4	1	4	4	3	7	5	5	9	13	8	2	5	4
1941.....	1	3	1	1	2	3	2	6	2	2	1	5	3	1
1929.....	22	21	24	15	39	30	27	54	70	24	44	41	32	36

¹ Similar tables appeared in Public Health Reports for Mar. 10, 1943, p. 494, and Apr. 16, 1943, p. 648

² Exclusive of Nevada.

³ Delayed report of 19 cases in Virginia included.

⁴ Delayed report of 15 cases in Virginia included.

⁵ Delayed report of 10 cases in Arizona included.

⁶ Delayed report of 15 cases in Arkansas included.

Mountain, and Pacific regions. In the New England region the number of cases (274) (reported for the 4 weeks ended April 24) was almost 20 times the 1938-42 median, while in the Pacific region the number (247) was more than 22 times the median. The numbers of cases have fluctuated considerably during recent weeks; the numbers reported for the country as a whole were 619 for the week ended April 17, 569 for the week ended April 24, and 591 for the week ended May 1.

For the country as a whole the current incidence has been higher each week of 1943 than it was in 1929. A comparison of geographic regions, however, shows that the disease has been most prevalent in regions along the Atlantic coast, with minor excesses over the 1929 figures in the South Central and Pacific regions; whereas in 1929 the highest incidence occurred in the North Central and Mountain regions.

States in which the disease was unusually prevalent during the current period were New York 261, Pennsylvania 149, New Jersey 113, Massachusetts 128, Michigan 87, Illinois 73, Missouri 95, Maryland 76, Virginia 111, North Carolina 79, South Carolina 69, Kentucky 72, Mississippi 78, California 182, and Idaho 31.

Measles.—For the 4 weeks ended April 24 there were approximately 104,000 cases of measles reported—an increase of about 17,000 cases over the preceding 4-week period. For the country as a whole and for each geographic area except the South Atlantic the current incidence was considerably above the 1938-42 median. The largest numbers of cases were reported from the North Atlantic and North Central regions. In the Middle Atlantic, East North Central, and East South Central regions the numbers of cases were more than 2.5 times the median and in other regions the incidence ranged from 1.2 times the median in the Pacific region to 1.9 times the median in the New England region. The current incidence for the country as a whole was the highest since 1938, when approximately 150,000 cases were reported for this period.

Poliomyelitis.—Poliomyelitis (81 cases) continued at a relatively high level, due largely to an excess in the number of cases in the East South Central, Mountain, and Pacific regions. In the other six regions the number of cases either closely approximated the median or fell considerably below it. In several preceding years this disease has reached its lowest level during this season of the year.

DISEASES BELOW MEDIAN PREVALENCE

Diphtheria.—The diphtheria incidence was slightly higher than it was during the corresponding period in 1942, but it was only about 80 percent of the 1938-42 median. The reported number of cases for the 4 weeks ended April 24 was 903. The Middle Atlantic, East North Central, Mountain, and Pacific regions each reported an in-

crease over the corresponding period of 1942, but the Mountain region alone reported an excess over the median expectancy.

Influenza.—The influenza incidence was also higher than in 1942, but the number of cases (12,335) reported for the current period represented a slight decline from the 5-year median figure (12,584) for the corresponding period. The West South Central region continued to report the highest incidence and the Middle Atlantic region reported a minor excess over the median, but in all other regions the incidence was relatively low.

Scarlet fever.—For the current period there were 17,096 cases of scarlet fever reported, as compared with 14,085 for the corresponding period in 1942 and a 1938–42 median figure of approximately 18,000 cases. In the New England region the incidence (3,041 cases) was about 2.4 times the median and in the Mountain region the number of cases (855) was almost twice the seasonal expectancy. Minor increases over the median were reported from the South Atlantic, West South Central, and Pacific regions, but in the other four regions the incidence was below the median seasonal level.

Smallpox.—The number of cases of smallpox was higher than in 1942 but it was considerably below the 1938–42 median. Of the 38 cases reported from the East North Central region, 25 occurred in the vicinity of Steubenville, Ohio. A few more cases than might be expected were reported from the South Atlantic region, but in all other regions the incidence was considerably below normal for this season of the year.

Typhoid fever.—The incidence of this disease reached a new low level. For the 4 weeks ended April 24, there were 244 cases reported as compared with 308, 291, and 339 for the corresponding period in 1942, 1941, and 1940, respectively. The 1938–42 median for this period was 339 cases. In the New England, East North Central, and Mountain regions the numbers of cases closely approximated the medians, while in all other regions the disease was considerably less prevalent than in recent years.

Whooping cough.—The number of cases of whooping cough rose from approximately 16,000 during the preceding 4-week period to 17,116 during the current period. Compared with recent years the incidence was about 15 percent above the 1938–42 median. Each section of the country except the New England, Middle Atlantic, and Mountain regions contributed to this relatively high incidence. Of the nine geographic regions, six reported excesses over the normal incidence and in the other three regions the incidence was comparatively low.

MORTALITY, ALL CAUSES

For the 4 weeks ended April 24 there was an average of approximately 9,600 deaths per week in the group of large cities reported upon by the Bureau of the Census. The average for the corresponding weeks in 1940-42 was approximately 8,700 deaths. The current figure represents an increase over the preceding 3-year average of almost 10 percent. Because of excessive internal migration, no accurate population estimates can be made, so it is impossible to say how much of this increase in deaths is due to increased population and how much represents an increased death rate.

Number of reported cases of 9 communicable diseases in the United States during the 4-week period March 28-April 24, 1943, the number for the corresponding period in 1942, and the median number of cases reported for the corresponding period, 1938-42

Division	Current period	1942	5-year median	Current period	1942	5-year median	Current period	1942	5-year median
	Diphtheria			Influenza ¹			Measles ²		
United States.....	903	872	1,104	12,335	11,481	12,584	103,989	90,465	95,455
New England.....	14	22	24	27	17	30	10,200	9,224	5,463
Middle Atlantic.....	163	132	175	145	71	92	26,935	10,294	10,294
East North Central.....	176	127	202	510	429	976	26,587	9,652	9,652
West North Central.....	62	91	91	108	298	303	8,132	10,319	7,223
South Atlantic.....	118	141	225	4,171	3,370	4,240	7,035	11,745	11,745
East South Central.....	62	83	88	1,076	917	1,262	4,341	1,634	1,634
West South Central.....	152	184	184	5,255	3,897	4,543	5,963	11,735	3,936
Mountain.....	74	44	66	681	1,240	706	6,851	5,167	3,832
Pacific.....	82	48	84	362	1,242	1,232	7,945	26,695	7,791
	Meningococcus meningitis			Polioomyelitis			Scarlet fever		
United States.....	2,369	390	225	81	53	71	17,096	14,685	18,008
New England.....	274	45	14	3	2	1	3,091	1,876	1,315
Middle Atlantic.....	523	132	52	5	12	11	4,423	4,269	5,470
East North Central.....	272	25	25	5	7	9	4,247	4,219	6,341
West North Central.....	142	16	9	5	0	5	1,552	1,576	1,576
South Atlantic.....	441	76	54	6	10	10	1,120	867	871
East South Central.....	248	35	35	14	6	7	475	620	620
West South Central.....	143	28	19	7	7	10	492	292	336
Mountain.....	79	5	5	14	5	4	855	409	451
Pacific.....	247	28	11	22	4	5	841	527	778
	Smallpox			Typhoid and paratyphoid fever			Whooping cough ³		
United States.....	105	95	277	244	308	339	17,116	14,182	14,592
New England.....	0	0	0	17	14	14	1,217	1,573	1,291
Middle Atlantic.....	0	0	0	37	54	61	3,164	3,724	3,423
East North Central.....	38	9	57	37	36	38	3,343	2,902	2,902
West North Central.....	8	21	129	10	15	19	1,031	531	531
South Atlantic.....	13	1	6	52	79	79	2,413	1,467	2,265
East South Central.....	17	15	18	23	35	42	723	666	636
West South Central.....	21	43	43	40	52	52	2,903	798	1,399
Mountain.....	2	1	39	16	6	14	577	815	864
Pacific.....	6	5	15	12	17	23	1,745	1,706	1,722

¹ Mississippi, New York, and Pennsylvania excluded; New York City included.

² Mississippi excluded.

PREVALENCE OF DISEASE

No health department, State or local, can effectively prevent or control disease without knowledge of when, where, and under what conditions cases are occurring

UNITED STATES

REPORTS FROM STATES FOR WEEK ENDED MAY 8, 1943

Summary

Totals below those for the preceding week were reported for all of the 9 common communicable diseases included in the following table, except meningococcus meningitis and whooping cough, and the incidence of only two—meningococcus meningitis and poliomyelitis—was more than slightly above the medians for the comparable weeks of the past 5 years (1938–42). The accumulated totals for the first 18 weeks of the year for only measles, meningococcus meningitis, and poliomyelitis are above the respective 5-year medians.

The total of meningococcus meningitis cases reported for the week was 604, as compared with 591 for the preceding week and an average of 588 for the past 3 weeks. The accumulated total of 8,816 cases for the first 18 weeks of the current year is more than was reported for any entire year since 1929, when 10,551 cases were reported. Figures for years earlier than 1929, though incomplete, and mortality figures issued by the Bureau of the Census indicate that the current incidence is probably higher than that of any prior year of record since 1913, with the single exception of 1929. Increases were recorded for the current week, and as compared with the averages for the past 3 weeks, in the South Atlantic, East South Central, and Pacific groups of States. Decreases occurred in all of the other geographic areas as compared with the preceding week and, except for the Middle Atlantic States, as compared with the preceding 3-week averages. States reporting the largest numbers (last week's figures in parentheses) were as follows: New York, 110 (76); California, 59 (34); Pennsylvania, 34 (36); Massachusetts, 33 (30); Illinois, 26 (29); Maryland, 25 (22); Ohio, 21 (17); Virginia, 21 (26); North Carolina, 21 (15); and Kentucky, 20 (16).

Poliomyelitis cases reported for the week totaled 26, as compared with a 5-year median of 13. Of the current number, 10 cases occurred in California and 4 each in Texas and Arizona. A total of 14 cases of Rocky Mountain spotted fever was reported for the week, 13 of which were in Mountain and Pacific States and 1 in South Dakota.

A total of 9,051 deaths was recorded in 87 large cities of the United States for the current week, as compared with 9,644 last week and 3-year average of 8,139. The cumulative total for 18 weeks of 1943 is 172,795, as compared with 157,210 for the same period of 1942.

Telegraphic morbidity reports from State health officers for the week ended May 8, 1943, and comparison with corresponding week of 1942 and 5-year median

In these tables a zero indicates a definite report, while leaders imply that, although none were reported, cases may have occurred.

Division and State	Diphtheria			Influenza			Measles			Meningitis, men- ingococcus		
	Week ended—		Med- ian 1938- 42	Week ended—		Med- ian 1938- 42	Week ended—		Med- ian 1938- 42	Week ended—		Med- ian 1938- 42
	May 8, 1943	May 9, 1942		May 8, 1943	May 9, 1942		May 8, 1943	May 9, 1942		May 8, 1943	May 9, 1942	
NEW ENG.												
Maine.....	0	0	0	-----	-----	2	15	142	177	2	6	0
New Hampshire.....	0	1	0	-----	-----	-----	74	13	13	3	0	0
Vermont.....	0	1	1	-----	-----	-----	276	154	72	1	0	0
Massachusetts.....	2	2	1	-----	-----	-----	1,762	1,305	975	33	7	2
Rhode Island.....	1	1	0	-----	-----	-----	11	225	66	14	0	0
Connecticut.....	0	2	2	-----	1	3	442	556	302	9	1	0
MID. ATL.												
New York.....	11	15	15	13	18	18	3,628	929	2,181	110	19	7
New Jersey.....	5	4	4	17	4	6	2,090	906	906	12	4	1
Pennsylvania.....	5	8	20	1	2	-----	1,678	1,711	1,711	34	0	1
E. NO. CEN.												
Ohio.....	16	6	16	14	7	7	889	500	42	21	0	1
Indiana.....	1	2	6	22	4	10	486	216	216	10	2	0
Illinois.....	29	10	20	13	4	11	1,942	396	396	26	0	1
Michigan ¹	5	4	4	63	1	1	2,286	438	629	12	2	1
Wisconsin.....	0	0	0	38	32	37	1,854	1,389	1,389	5	0	1
W. NO. CEN.												
Minnesota.....	3	1	1	-----	-----	2	390	875	254	1	0	0
Iowa.....	1	0	2	-----	-----	1	249	259	253	4	0	0
Missouri.....	2	1	3	-----	1	2	282	378	378	13	3	1
North Dakota.....	0	1	1	27	-----	6	182	35	31	0	0	0
South Dakota.....	0	0	0	-----	-----	-----	86	23	14	3	0	0
Nebraska.....	1	6	1	3	11	-----	157	416	233	0	0	0
Kansas.....	2	5	5	1	1	4	645	557	621	5	0	0
SO. ATL.												
Delaware.....	0	1	0	-----	-----	-----	75	23	10	7	1	0
Maryland ¹	1	4	3	10	11	7	223	500	292	25	8	2
Dist. of Col.....	1	1	0	2	-----	-----	77	121	121	5	3	1
Virginia.....	4	5	5	180	143	110	452	289	458	21	4	3
West Virginia.....	3	5	5	13	19	20	52	102	102	6	2	2
North Carolina.....	7	4	12	8	11	11	353	543	866	21	0	1
South Carolina.....	2	1	5	422	167	270	134	141	141	9	3	1
Georgia.....	4	1	3	29	17	38	229	164	164	5	1	1
Florida.....	2	6	2	10	4	4	87	306	220	12	0	0
E. SO. CEN.												
Kentucky.....	4	5	4	7	7	7	290	54	95	20	0	3
Tennessee.....	4	9	3	32	18	18	393	123	179	19	2	1
Alabama.....	4	5	5	60	49	45	156	198	264	9	3	1
Mississippi ¹	5	6	6	-----	-----	-----	-----	-----	-----	13	1	1
W. SO. CEN.												
Arkansas.....	4	7	4	16	47	58	122	111	155	13	1	0
Louisiana.....	2	2	2	5	3	9	173	191	75	5	2	2
Oklahoma.....	4	5	5	14	43	75	52	176	176	2	2	2
Texas.....	13	36	22	512	407	407	647	1,293	1,120	15	7	2
MOUNTAIN												
Montana.....	0	1	2	12	-----	-----	145	81	51	0	0	0
Idaho.....	0	1	0	2	-----	-----	58	57	30	6	0	0
Wyoming.....	0	0	0	6	110	-----	162	67	52	0	0	0
Colorado.....	11	4	11	18	45	10	576	202	331	1	0	0
New Mexico.....	0	1	0	3	1	1	14	35	36	0	0	0
Arizona.....	0	1	1	42	56	56	36	127	98	0	0	0
Utah ¹	1	0	0	13	5	5	179	1,402	267	6	0	0
Nevada.....	0	0	-----	-----	-----	-----	16	24	-----	0	0	-----
PACIFIC												
Washington.....	7	1	1	-----	5	-----	389	377	377	14	1	1
Oregon.....	1	0	0	30	14	20	332	125	125	4	0	1
California.....	20	10	11	71	70	36	1,186	5,724	686	59	4	1
Total.....	188	192	215	1,732	1,328	1,532	26,032	23,979	23,979	1,605	89	47
18 weeks.....	4,742	5,070	6,185	70,068	72,364	141,425	340,866	329,134	329,134	8,817	1,400	897

See footnotes at end of table.

Telegraphic morbidity reports from State health officers for the week ended May 8, 1943, and comparison with corresponding week of 1942 and 5-year median—Con.

Division and State	Poliomyelitis			Scarlet fever			Smallpox			Typhoid and paratyphoid fever		
	Week ended—		Median 1938-42	Week ended—		Median 1938-42	Week ended—		Median 1938-42	Week ended—		Median 1938-42
	May 8, 1943	May 9, 1942		May 8, 1943	May 9, 1942		May 8, 1943	May 9, 1942		May 8, 1943	May 9, 1942	
NEW ENG.												
Maine.....	0	0	0	12	14	15	0	0	0	0	0	0
New Hampshire.....	0	0	0	14	9	1	0	0	0	0	0	0
Vermont.....	0	0	0	15	7	7	0	0	0	0	2	0
Massachusetts.....	0	1	0	472	294	196	0	0	0	0	0	1
Rhode Island.....	0	0	0	28	12	12	0	0	0	0	0	0
Connecticut.....	0	0	0	124	30	77	0	0	0	1	3	0
MID. ATL.												
New York.....	3	1	1	553	408	613	0	0	0	7	4	5
New Jersey.....	0	0	0	148	147	223	0	0	0	0	5	4
Pennsylvania.....	0	1	1	262	423	423	0	0	0	0	6	7
E. NO. CEN.												
Ohio.....	2	1	1	320	314	314	6	0	1	0	11	9
Indiana.....	0	0	0	78	71	103	1	2	6	2	0	1
Illinois.....	0	3	0	156	143	398	0	1	2	2	5	5
Michigan.....	1	0	0	112	148	356	0	1	5	1	0	1
Wisconsin.....	1	0	0	315	167	128	1	1	1	0	0	0
W. NO. CEN.												
Minnesota.....	0	0	0	70	79	79	0	0	2	0	0	0
Iowa.....	0	0	0	57	27	53	0	1	13	0	0	2
Missouri.....	0	0	0	91	55	81	0	0	17	1	0	1
North Dakota.....	0	0	0	11	17	9	0	0	1	0	3	1
South Dakota.....	0	0	0	13	21	15	3	0	1	0	0	0
Nebraska.....	0	0	0	17	24	23	0	0	2	1	0	0
Kansas.....	1	1	0	37	46	60	0	1	1	0	0	1
SO. ATL.												
Delaware.....	0	0	0	0	21	9	0	0	0	0	0	0
Maryland.....	0	0	0	136	76	40	0	0	0	2	4	2
Dist. of Col.....	0	0	0	22	5	14	0	0	0	0	0	1
Virginia.....	0	0	0	39	16	24	0	0	0	1	4	1
West Virginia.....	0	1	0	25	24	36	0	0	0	1	0	8
North Carolina.....	0	0	0	37	16	21	0	0	0	2	1	1
South Carolina.....	0	2	0	2	4	3	0	0	0	1	1	3
Georgia.....	0	1	1	6	5	12	0	1	0	2	6	6
Florida.....	0	0	1	12	3	3	0	0	0	4	17	4
E. SO. CEN.												
Kentucky.....	0	0	0	65	45	45	0	0	0	0	7	6
Tennessee.....	0	0	0	41	32	42	1	0	0	1	2	2
Alabama.....	0	1	1	11	13	12	3	0	0	2	4	4
Mississippi.....	0	0	0	5	6	6	0	1	1	0	2	1
W. SO. CEN.												
Arkansas.....	0	0	1	0	3	3	0	2	2	2	1	3
Louisiana.....	0	0	0	10	1	4	0	0	0	2	5	5
Oklahoma.....	0	1	1	12	4	18	0	0	12	0	0	3
Texas.....	4	3	1	48	24	41	2	5	14	3	6	6
MOUNTAIN												
Montana.....	0	0	0	21	9	21	0	0	0	0	0	1
Idaho.....	0	0	0	112	0	5	0	0	0	0	0	0
Wyoming.....	0	0	0	3	17	11	0	0	0	0	0	1
Colorado.....	0	0	0	59	17	30	0	1	1	0	0	0
New Mexico.....	0	0	0	4	6	6	0	0	0	1	0	1
Arizona.....	4	0	0	9	6	6	0	0	4	1	0	0
Utah.....	0	0	0	46	11	11	0	0	0	6	0	0
Nevada.....	0	0	0	0	0	0	0	0	0	0	0	0
PACIFIC												
Washington.....	0	0	0	37	35	31	0	0	0	0	0	1
Oregon.....	0	0	0	18	7	13	0	1	12	0	1	1
California.....	10	2	2	174	113	126	0	0	1	4	2	5
Total.....	26	19	13	3,859	2,975	4,099	17	18	95	50	102	115
18 weeks.....	455	377	377	71,761	69,339	86,787	476	395	1,332	1,029	1,405	1,461

See footnotes at end of table.

Telegraphic morbidity reports from State health officers for the week ended May 8, 1943, and comparison with corresponding week 1942 and 5-year median—Continued

Division and State	Whooping cough			Week ended May 8, 1943									
	Week ended—		Median 1938- 42	An- thrax	Dysentery			En- ceph- alitis, infectious	Lep- tosis	Rocky Mt. spotted fever	Tula- remia	Ty- phus fever	
	May 8, 1943	May 9, 1942			Ame- bic	Bacil- lary	Un- spec- ified						
NEW ENG.													
Maine.....	41	30	30	0	0	0	0	0	0	0	0	0	
New Hampshire.....	6	3	3	0	0	0	0	0	0	0	0	0	
Vermont.....	12	24	33	0	0	0	0	0	0	0	0	0	
Massachusetts.....	136	258	166	0	0	8	0	0	0	0	0	0	
Rhode Island.....	34	14	20	0	0	0	0	0	0	0	0	0	
Connecticut.....	22	94	73	0	0	9	0	0	0	0	0	0	
MID. ATL.													
New York.....	294	474	446	0	2	17	0	3	0	0	0	0	
New Jersey.....	181	341	244	0	0	0	0	0	0	0	0	0	
Pennsylvania.....	208	229	327	0	0	0	0	0	0	0	0	1	
E. NO. CEN.													
Ohio.....	154	288	173	0	0	0	0	0	0	0	0	0	
Indiana.....	47	42	42	0	1	0	0	0	0	0	0	0	
Illinois.....	157	255	120	0	0	0	0	1	0	0	1	0	
Michigan.....	239	139	157	0	0	0	0	0	0	0	0	0	
Wisconsin.....	209	247	143	0	0	0	0	1	0	0	0	0	
W. NO. CEN.													
Minnesota.....	90	20	23	0	0	0	0	0	0	0	0	0	
Iowa.....	21	18	31	0	0	0	0	1	0	0	0	0	
Missouri.....	22	8	15	0	0	0	0	0	0	0	1	0	
North Dakota.....	28	13	13	0	0	0	0	0	0	0	0	0	
South Dakota.....	13	1	1	0	0	0	0	0	0	1	0	0	
Nebraska.....	8	0	6	0	0	0	0	0	0	0	0	0	
Kansas.....	136	36	40	0	0	0	0	1	0	0	0	0	
SO. ATL.													
Delaware.....	0	0	8	0	0	0	0	0	0	0	0	0	
Maryland.....	128	52	64	0	0	0	0	0	0	0	0	0	
Dist. of Col.....	28	12	12	0	0	0	0	0	0	0	0	0	
Virginia.....	118	43	61	0	0	0	28	0	0	0	0	0	
West Virginia.....	51	11	33	0	0	0	0	0	0	0	0	0	
North Carolina.....	203	115	285	0	1	1	0	0	0	0	0	0	
South Carolina.....	67	64	99	0	1	11	0	0	0	0	0	1	
Georgia.....	11	55	39	0	0	3	0	0	0	0	1	5	
Florida.....	52	62	26	0	1	0	0	1	0	0	0	4	
E. SO. CEN.													
Kentucky.....	39	79	79	0	0	0	1	0	0	0	0	0	
Tennessee.....	72	55	42	0	0	0	1	0	0	0	1	0	
Alabama.....	56	44	40	0	0	0	0	0	0	0	0	1	
Mississippi.....				0	0	0	0	0	0	0	0	0	
W. SO. CEN.													
Arkansas.....	45	8	26	0	0	6	0	0	0	0	2	² 2	
Louisiana.....	5	2	3	0	0	0	0	0	0	0	0	0	
Oklahoma.....	37	2	33	0	0	0	0	0	0	0	0	0	
Texas.....	612	347	291	0	8	146	0	1	0	0	1	15	
MOUNTAIN													
Montana.....	15	17	17	0	0	0	0	0	0	4	0	0	
Idaho.....	14	4	3	0	0	0	0	0	0	0	0	0	
Wyoming.....	3	1	2	0	0	0	0	0	0	3	0	0	
Colorado.....	23	18	40	0	0	4	0	0	0	1	0	0	
New Mexico.....	4	29	35	0	0	0	0	0	0	0	0	0	
Arizona.....	32	26	26	0	0	0	27	1	0	0	0	0	
Utah.....	66	21	65	0	0	0	1	0	0	1	0	0	
Nevada.....	3	4		0	0	0	0	0	0	0	0	0	
PACIFIC													
Washington.....	46	70	64	0	0	0	0	0	0	0	0	0	
Oregon.....	19	19	19	0	0	0	0	0	0	3	0	0	
California.....	582	283	354	0	4	2	0	1	0	1	0	0	
Total.....	4,389	3,977	3,977	0	18	207	58	11	0	14	7	² 29	
18 weeks.....	72,653	69,361	72,625	25	528	3,495	840	200	8	40	291	817	
18 weeks, 1942.....				29	305	1,200	681	137	22	47	319	654	

¹ New York City only.

² Period ended earlier than Saturday.

³ Delayed report of 1 case of meningococcus meningitis and 1 case of typhus fever in Arkansas for the week ended May 1 included.

WEEKLY REPORTS FROM CITIES

City reports for week ended April 24, 1943

This table lists the reports from 87 cities of more than 10,000 population distributed throughout the United States, and represents a cross section of the current urban incidence of the diseases included in the table.

	Diphtheria cases	Encephalitis, infectious, cases	Influenza		Measles cases	Meningitis, meningococ- cus, cases	Pneumonia deaths	Pollomyelitis cases	Scarlet fever cases	Smallpox cases	Typhoid and paratyphoid fever cases	Whooping cough cases
			Cases	Deaths								
NEW ENG.												
Maine:												
Portland	0	0	1	1	1	6	4	0	2	0	0	0
New Hampshire:												
Concord	0	0		1	1	0	1	0	0	0	0	0
Vermont:												
Barre	0	0		0	2	0	0	0	0	0	0	26
Massachusetts:												
Boston	2	0		2	211	7	21	0	164	0	0	0
Fall River	0	0		0	104	0	1	0	1	0	0	4
Springfield	0	0		0	16	1	0	0	86	0	0	0
Worcester	0	0		0	228	0	8	0	4	0	0	25
Rhode Island:												
Providence	1	0	1	0	4	7	6	0	12	0	0	0
Connecticut:												
Bridgeport	0	1		0	0	1	2	0	7	0	0	4
Hartford	0	0		0	53	1	4	0	7	0	0	2
New Haven	0	0		0	10	0	1	0	3	0	1	
MID. ATL.												
New York:												
Buffalo	0	0	3	0	81	5	8	0	8	0	0	4
New York	16	0	30	2	842	53	83	0	430	0	2	60
Rochester	0	1		0	102	0	6	0	12	0	1	13
Syracuse	0	0		0	78	3	2	0	17	0	1	19
New Jersey:												
Camden	1	0		0	0	0	2	0	2	0	0	0
Newark	0	0	4	0	334	0	6	0	12	0	1	31
Trenton	0	0		0	61	0	2	0	11	0	0	1
Pennsylvania:												
Philadelphia	3	0	1	0	233	12	19	0	134	0	0	52
Pittsburgh	1	0	1	1	30	7	19	0	11	0	1	30
Reading	0	0		0	91	0	2	0	2	0	0	8
E. NO. CEN.												
Ohio:												
Cincinnati	0	0		2	75	3	4	0	37	0	0	7
Cleveland	2	0	7	2	25	4	3	0	51	0	0	38
Columbus	0	0		0	46	0	6	0	20	0	0	4
Indiana:												
Fort Wayne	0	0		0	5	0	5	0	8	0	0	0
Indianapolis	1	0		3	235	1	9	0	38	0	0	32
South Bend	0	0		0	8	0	0	0	1	0	0	1
Terre Haute	0	0		0	10	0	2	0	0	0	0	0
Illinois:												
Chicago	14	0	1	1	828	13	27	0	74	0	0	51
Springfield	0	0		0	3	0	2	0	2	0	0	2
Michigan:												
Detroit	1	0		2	1,247	12	10	0	46	0	0	78
Flint	0	0		0	184	0	5	0	5	0	0	23
Grand Rapids	0	0		0	9	0	0	0	5	0	0	15
Wisconsin:												
Kenosha	0	0		0	1	0	0	0	4	0	0	0
Milwaukee	0	0	1	1	477	0	1	0	182	0	0	79
Racine	0	0		0	4	0	0	0	21	0	0	0
Superior	0	0		0	8	0	0	0	5	0	0	4
W. NO. CEN.												
Minnesota:												
Duluth	0	0		0	9	0	1	0	6	0	0	1
Minneapolis	0	0		0	133	1	2	0	21	0	0	16
St. Paul	0	0		0	24	0	4	0	2	0	0	28
Missouri:												
Kansas City	0	0		1	104	1	5	0	49	0	0	8
St. Joseph	0	0		0	2	0	3	0	0	0	0	1
St. Louis	0	0	2	2	38	12	10	0	18	0	0	10
North Dakota:												
Fargo	0	0		0	0	0	1	0	1	0	0	3
Nebraska:												
Omaha	0	0		0	10	0	4	0	5	0	0	2
Kansas:												
Topeka	0	0		0	189	0	3	0	1	0	0	29
Wichita	0	0	1	0	134	0	4	0	4	0	0	16

City reports for week ended April 24, 1943—Continued

	Diphtheria cases	Encephalitis, infectious, cases	Influenza		Measles cases	Meningitis, meningococ- cus, cases	Pneumonia deaths	Pollomyelitis cases	Scarlet fever cases	Smallpox cases	Typhoid and paratyphoid fever cases	Whooping cough cases
			Cases	Deaths								
SO. ATL.												
Delaware:												
Wilmington	0	0		0	26	0	1	0	0	0	0	1
Maryland:												
Baltimore	1	0	2	1	76	16	15	0	61	0	2	86
Cumberland	0	0	1	0	0	0	0	0	0	0	0	0
Frederick	0	0		0	3	0	0	0	0	0	0	0
Dist. of Col.:												
Washington	1	0	3	1	78	2	7	0	20	0	0	17
Virginia:												
Lynchburg	0	0		0	2	0	0	0	1	0	0	6
Richmond	0	0		0	9	2	2	0	0	0	0	1
Roanoke	0	0		0	0	0	2	0	0	0	0	0
West Virginia:												
Wheeling	0	0		0	62	0	1	0	1	0	0	5
North Carolina:												
Winston-Salem	0	0		0	1	0	2	0	0	0	0	12
South Carolina:												
Charleston	1	0	3	1	5	3	3	0	1	0	1	4
Georgia:												
Atlanta	0	0	14	1	24	0	7	0	8	0	0	3
Brunswick	0	0	1	1	4	1	5	0	0	0	0	0
Savannah	0	0		1	1	0	2	0	0	0	0	1
Florida:												
Tampa	0	0		0	4	0	6	0	0	0	0	0
E. SO. CEN.												
Tennessee:												
Memphis	0	0	5	0	245	2	3	0	1	0	0	20
Nashville	0	0		1	23	0	2	0	2	0	0	9
Alabama:												
Birmingham	0	0	7	0	11	0	4	0	0	0	0	3
Mobile	1	0	1	0	0	1	1	0	1	0	0	0
W. SO. CEN.												
Arkansas:												
Little Rock	0	0		0	7	0	3	0	1	0	0	0
Louisiana:												
New Orleans	0	0	2	1	31	5	9	0	3	0	1	0
Shreveport	0	0		0	0	0	3	0	0	0	0	0
Texas:												
Dallas	0	0	1	1	6	0	4	0	4	0	0	16
Galveston	0	0		0	5	0	2	0	0	0	0	11
Houston	0	0		2	6	1	3	0	4	0	0	7
San Antonio	2	0	1	1	3	0	3	0	1	0	0	1
MOUNTAIN												
Montana:												
Billings	0	0		0	2	0	0	0	0	0	0	3
Great Falls	0	0		0	50	0	1	0	0	0	0	1
Helena	0	0		0	31	0	0	0	0	0	0	0
Missoula	0	0		0	5	0	0	0	1	0	0	0
Idaho:												
Boise	0	0		0	4	0	0	0	0	0	0	0
Colorado:												
Denver	1	0	7	0	425	1	6	0	11	0	1	9
Pueblo	0	0		0	20	0	1	0	2	0	0	11
Utah:												
Salt Lake City	0	0		0	112	1	1	1	5	0	0	50
PACIFIC												
Washington:												
Seattle	1	0		1	208	1	2	0	2	0	1	15
Spokane	0	0		0	82	0	1	0	0	0	0	4
Tacoma	2	0		0	8	1	0	0	4	0	0	3
California:												
Los Angeles	2	0	19	2	117	2	8	1	20	0	0	49
Sacramento	1	0		0	8	4	3	0	0	1	0	4
San Francisco	0	0	1	0	75	6	13	0	26	0	2	22
Total	55	2	121	36	8,066	199	434	2	1,711	1	15	1,107
Corresponding week, 1942	58	3	103	26	6,327	33	368	2	1,384	0	14	1,195
Average, 1938-42	77		162	34	26,199		416		1,598	10	18	1,153

Dysentery, amebic.—Cases: New York, 1.

Dysentery, bacillary.—Cases: New York, 5; Philadelphia, 1; Detroit, 3; Los Angeles, 5.

Dysentery, unspecified.—Cases: San Antonio, 7. Typhoid fever.—Cases: Atlanta, 1; Little Rock, 1.

Typhoid fever.—Cases: Savannah, 1; Mobile, 1; San Antonio, 1.

13-year average, 1940-42. 5-year median.

Rates (annual basis) per 100,000 population, by geographic groups, for the 87 cities in the preceding table (estimated population, 1942, 34,614,400)

	Diphtheria case rates	Etiology, infectious, case rates	Influenza		Measles case rates	Meningitis, meningococcus, case rates	Pneumonia death rates	Polio myelitis case rates	Scarlet fever case rates	Smallpox case rates	Typhoid and paratyphoid fever case rates	Whooping cough case rates
			Case rates	Death rates								
NEW ENG.....	7.5	2.5	5.0	9.9	1,565	57.1	119.3	0.0	711	0.0	2.5	176
MID. ATL.....	9.4	.4	17.4	1.3	826	35.7	66.5	0	284	0	2.7	97
E. NO. CEN.....	10.5	0	5.3	6.4	1,846	19.3	43.2	0	291	0	0	195
W. NO. CEN.....	0.0	0	5.9	5.9	1,257	27.4	72.3	0	209	0	0	223
So. ATL.....	5.3	0	42.6	10.6	523	42.6	94.0	0	163	0	5.3	234
E. SO. CEN.....	5.9	0	77.2	5.9	1,657	17.8	59.4	0	24	0	0	190
W. SO. CEN.....	5.9	0	11.7	14.7	170	17.6	79.2	0	38	0	2.9	103
MOUNTAIN.....	8.0	0	56.3	0.0	5,218	16.1	72.4	8.0	153	0	8.0	595
PACIFIC.....	10.5	0	35.0	5.2	870	24.5	47.2	1.7	91	1.7	5.2	170
Total.....	8.3	0.3	18.2	5.4	1,215	30.0	65.4	0.3	258	0.2	2.3	167

PLAGUE INFECTION IN TACOMA, WASH.

Plague infection has been reported proved in pools of fleas and tissue from rats, *R. norvegicus*, collected in frame buildings in industrial districts of Tacoma, Wash., as follows: April 12, 90 fleas from 103 rats; April 20, 53 fleas from 84 rats, and 50 fleas from 120 rats; April 21, tissue from 4 rats; April 22, 118 fleas from 28 rats.

TERRITORIES AND POSSESSIONS

Panama Canal Zone

Notifiable diseases—February 1943.—During the month of February 1943, certain notifiable diseases were reported in the Panama Canal Zone, and terminal cities, as follows:

Disease	Panama		Colon		Canal Zone		Outside the Zone and terminal cities		Total	
	Cases	Deaths	Cases	Deaths	Cases	Deaths	Cases	Deaths	Cases	Deaths
Chickenpox.....	16		6		10		2		34	
Diphtheria.....	12	1			4		4		20	1
Dysentery (amebic).....	1		2		1		4		8	
Dysentery (bacillary).....	2				3		1		6	
Malaria ¹	27		4		313	1	112	2	456	3
Measles.....	3				12				15	
Mumps.....	25		1		16		13		55	
Paratyphoid fever.....			1		4		1		6	
Pneumonia.....		9		4	39	2		3	39	18
Relapsing fever.....							1		1	
Scarlet fever.....			1						1	
Tuberculosis.....		23		1	3	5		8	3	37
Typhoid fever.....	1		1		1				3	
Whooping cough.....					2				2	

¹ Includes 100 recurrent cases.

² Reported in the Canal Zone only.

FOREIGN REPORTS

CANADA

Provinces—Communicable diseases—Week ended April 10, 1943.—During the week ended April 10, 1943, cases of certain communicable diseases were reported by the Dominion Bureau of Statistics of Canada as follows:

Disease	Prince Edward Island	Nova Scotia	New Brunswick	Quebec	Ontario	Manitoba	Saskatchewan	Alberta	British Columbia	Total
Chickenpox.....		9		112	209	23	14	35	58	469
Diphtheria.....		12	3	16		5				36
Dysentery (bacillary).....				7						7
German measles.....		8		41	88	1	3	20	4	165
Influenza.....			4		86	6	2		100	198
Measles.....		92	2	217	833	110	225	122	317	1,918
Meningitis, meningococcus.....				4	6	3		1		14
Mumps.....	3	52	2	109	1,083	152	116	66	170	1,753
Poliomyelitis.....				1			1			2
Scarlet fever.....	1	19	9	148	247	40	45	43	20	572
Tuberculosis (all forms).....	2	14	4	70	44	23	27	2	22	208
Typhoid and paratyphoid fever.....		2	3	60						65
Undulant fever.....				1	3					4
Whooping cough.....				59	104	76	20	23	26	308

HAITI

Anthrax.—For the period April 8–19, 1943, 3 human cases of anthrax are reported to have been hospitalized in Gonaives, Haiti.

REPORTS OF CHOLERA, PLAGUE, SMALLPOX, TYPHUS FEVER, AND YELLOW FEVER RECEIVED DURING THE CURRENT WEEK

NOTE.—Except in cases of unusual prevalence, only those places are included which had not previously reported any of the above-mentioned diseases, except yellow fever, during the current year. All reports of yellow fever are published currently.

A cumulative table showing the reported prevalence of these diseases for the year to date is published in the **PUBLIC HEALTH REPORTS** for the last Friday in each month.

(Few reports are available from the invaded countries of Europe and other nations in war zones.)

Plague

Indochina—Cochinchina.—For the period January 11–20, 1943, 3 cases of plague with 3 deaths were reported in Cochinchina, Indochina.

Morocco.—During the month of February 1943, 19 cases of plague were reported in Morocco.

Typhus Fever

Guatemala.—During the month of March 1943, 146 cases of typhus fever with 19 deaths were reported in Guatemala.

Irish Free State—Leitrim County.—During the week ended April 10, 1943, 3 cases of typhus fever were reported in Leitrim County, Irish Free State.

Spanish Morocco—Melilla.—For the week ended February 6, 1943, 1 case of typhus fever was reported in Melilla, Spanish Morocco.

DEATHS DURING WEEK ENDED MAY 1, 1943

[From the Weekly Mortality Index, issued by the Bureau of the Census, Department of Commerce]

	Week ended May 1, 1943	Correspond- ing week, 1942
Data from 90 large cities of the United States:		
Total deaths.....	9,986	8,638
Average for 3 prior years.....	8,495	
Total deaths, first 17 weeks of year.....	170,099	154,794
Deaths under 1 year of age.....	662	613
Average for 3 prior years.....	533	
Deaths under 1 year of age, first 17 weeks of year.....	11,784	9,769
Data from industrial insurance companies:		
Policies in force.....	65,501,549	65,234,283
Number of death claims.....	12,537	12,164
Death claims per 1,000 policies in force, annual rate.....	10.0	9.7
Death claims per 1,000 policies, first 17 weeks of year, annual rate.....	10.6	10.2

COURT DECISION ON PUBLIC HEALTH

Possession of shellfish received from unregistered shipper.—(New York Court of Appeals; *People v. Thompson & Potter, Inc.*, 45 N.E.2d 432; decided December 3, 1942.) The New York City Sanitary Code provided that no dealer in shellfish or other foods should “purchase or have in his possession” shellfish received from a shipper of shellfish not registered for shipping shellfish into the city. The defendant, a wholesale commission house dealing as a broker in shellfish, was convicted by the trial court of having in its possession three bags of oysters received from a shipper who was not registered with the health department as an approved shipper of shellfish into the city. It appeared that on a particular day 40 shipments of shellfish were delivered before 6 a. m. when the defendant opened its place of business and that the market watchman admitted the shipments into the premises. An officer and an employee of the defendant arrived about 6 a. m., but claimed that they had not completed their checking of these shipments by 11 o’clock because of the rush of business. A health department inspector found two of the bags of oysters involved at 9:45 a. m. and the third at 11 a. m. Preceding each inspection the inspector inquired in effect whether the defendant had any shipments from unregistered sources and was told “No.” The defendant had a list of approved shippers in its office with which it was its duty to compare the tags on the bags and return goods not on the approved list.

The Court of Appeals of New York said that the purpose of the New York City ordinance was to protect the consumer against the danger of disease involved in eating shellfish taken from sources which were not approved by the health authorities. According to the court a decisive point in the case was the proper construction of the term “possession” as used in the ordinance, and respecting this the

court found nothing unreasonable in construing the provision as it was written, namely, that the mere receipt of shellfish into a dealer's premises constituted "possession" within the meaning of the sanitary code. A contrary holding, said the court, would render the enforcement of the code almost impossible and expose the consuming public to the very danger against which protection was sought. "To allow contaminated shellfish to be mingled with a dealer's goods for any period of time involves the peril that the shellfish may be resold to the consuming public without detection by the health authorities, since it is shown that the turnover in this business is both large and immediate." The ordinance was said to be a fair and appropriate exercise of the police power as applied to the subject matter and designed to protect the public health. As applying with force in the instant case, the following was quoted from the opinion in a prior case: "Food laws are designed primarily, not for the punishment of the dealer, but for the protection of the consumer. In this field of law, the obligation to beware is on the seller rather than the buyer. Lack of proof of guilty intent does not satisfy that obligation."

The judgment of the trial court was affirmed.

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